

U.G. 4th Semester Examination - 2024

CHEMISTRY

[HONOURS]

Course Code : CHEM-H-CC-T-10

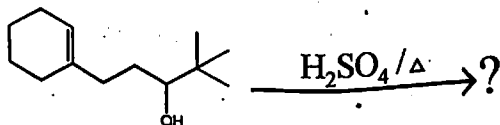
(Organic)

Full Marks : 40

Time : 2½ Hours

*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.*1. Answer any five questions: 2×5=10

- Provide an example of conjugate addition of nitroalkyl anion.
- Convert: $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{NH}_2 \rightarrow \text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$
- Predict the product(s) of the following reaction and explain with mechanism.



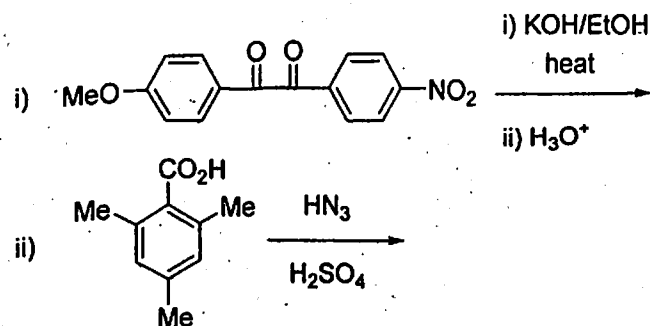
- For the success of Dakin reaction there must be an $-\text{OH}$ or $-\text{NH}_2$ group in the *ortho* or *para* position of aromatic aldehyde or ketone-explain.

[Turn Over]

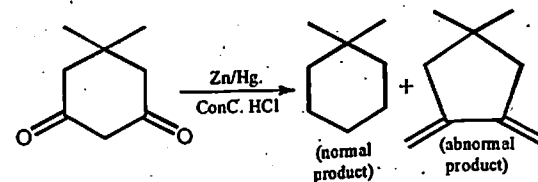
- e) What do you mean by illogical electrophile? Provide an example.
- f) What do you mean by *end absorption*?
- g) What is a non-first-order spectrum in NMR spectroscopy?

2. Answer any two questions: $5 \times 2 = 10$

- a) i) Discuss the reactions of aniline, *N*-methylaniline and dimethyl aniline with NaNO_2 and dilute HCl in the cold.
- ii) What happens when *N*-chloroacetanilide is treated with aqueous HCl ? $3 + 2 = 5$
- b) Predict the product(s) of the following reactions with proper mechanistic explanation. $2 \frac{1}{2} \times 2 = 5$



- c) i) How would you explain the formation of the abnormal product in the following reaction?



- ii) Provide example of magnetically equivalent protons with explanation. $3 + 2 = 5$

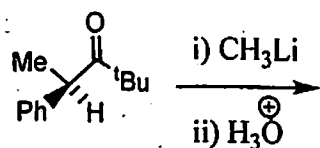
3. Answer any two questions: $10 \times 2 = 20$

- a) i) Write down the possible enolates of RCOCH_2R and draw the transition states for the formation of *syn* and *anti* addition products on their reaction with $\text{R}'\text{CHO}$ utilizing Zimmermann-Traxler model.
- ii) How can you differentiate *ortho* and *para*-bromoaniline by means of ^1H NMR spectroscopy?
- iii) What will be the change of UV absorption bands of mesityl oxide on changing the solvent from non-polar aprotic to polar protic? Explain with MO levels.

$4 + 2 + 4 = 10$

b) i) In IR spectroscopy, ethyl acetoacetate shows the peaks at 1715 cm^{-1} , 1690 cm^{-1} , 2900 cm^{-1} , 3500 cm^{-1} . How will you justify it?

ii) Use Felkin-Anh model to explain the formation of major product in the following reaction:



iii) Explain with proper mechanism what will happen when 4-bromonitrobenzene is treated with KCN in presence of aq. ethanol.

iv) Mention the criteria for good protecting group.

$$3 + 2\frac{1}{2} + 2\frac{1}{2} + 2 = 10$$

c) i) Deduce the structure of the compound with proper discussion having the following spectral data:

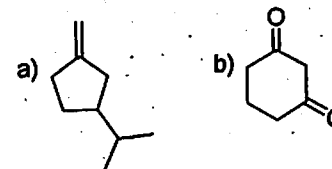
Mol Wt = 120;

UV: λ_{max} 254 nm ϵ_{max} very high

IR: 3020 (w), 2740 (w), 1742 (s), 1602 (m) cm^{-1}

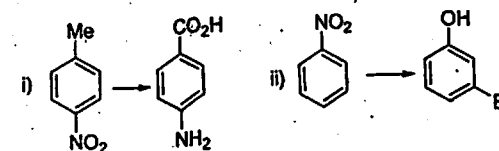
NMR: 9.45 (t, 5.3 sq), 7.25 (s, 27 sq), 2.8 (d, 11 sq)

ii) Depict the synthesis of the following compounds showing the corresponding retro-synthetic analysis.



$$5 + (2\frac{1}{2} + 2\frac{1}{2}) = 10$$

d) i) Carry out the following conversion by indicating suitable reagents in each step:



ii) What will happen when nitrobenzene is treated with an alkaline solution of benzenediazonium chloride.

iii) Provide the utility of diazomethane in
i) homologation of cyclic ketone and
ii) synthesis of heterocyclic ring.

Show the mechanism involved in each case.

$$(2+2) + (2+2) + 2 = 10$$